Philosophers have long dreamed that moral disagreement might be resolved scientifically by mathematical calculation. Leibniz, for example, hoped for a day in which "two philosophers who disagreed about a particular point instead of arguing fruitlessly would take out their pencils and calculate."¹ To most present day philosophers, this dream is but a pipedream; but most present day philosophers could be mistaken, as Frank G. Forrest attempts to show in his Valuemetrics: The Science of Personal and Professional Ethics.

Robert S. Hartman, the creator of formal axiology, laid the foundations for a science of values that would permit value disagreements to be resolved by calculation; but Hartman did not live long enough to build the algorithmic superstructure for this science. Forrest's valuemetrics is a brilliant attempt to erect the frames of this edifice.

Formal axiology differs from traditional philosophical approaches to value theory by applying a formal frame of reference to the subject matter of values. Hartman thought that the frame of reference provided by set theory and cardinal arithmetic would be adequate to define the concept of value, to differentiate a hierarchy of values, to express combinations of values, and to determine the relative worth of value situations whether simple or complex. He defined "value" as degree of concept fulfillment. This permits us to identify kinds of value and disvalue (e.g. "good," "fair," "bad") as degrees of success or failure to fulfill standards framed by concepts.

Hartman distinguished between three fundamental kinds of value—intrinsic, extrinsic, and systemic; and he correlated each of these with a characteristic number in transfinite mathematics (cardinal arithmetic). As Hartman worked it out, intrinsic values, which supposedly have a nondenumerable infinity of properties and fulfill nondenumerably rich concepts, are assigned the characteristic number of aleph sub-one (\(\aleph_1\)); and...
individual persons or centers of conscious experience and activity are identified as intrinsic values. Extrinsic values supposedly have a denumerable infinity of properties and fulfill denumerably rich concepts; and things (sensory objects) and social functions are identified as extrinsic values and assigned the characteristic number of aleph sub-zero \( (\aleph_0) \). Finally, Hartman recognized a previously unacknowledged form of value—systemic values. Systemic values have a finite number of properties and fulfill concepts that are only finitely rich in properties. Conceptual constructs like mathematical or logical forms, scientific, philosophical, or religious theories and beliefs, and humanly fabricated social ideas and relations are identified as systemic values and are assigned the characteristic number \( (n) \) to indicate their finitude.

Hartman developed the idea that the three basic forms of value can be combined with one another in an endless variety of positive or negative ways. For example, persons can be valued by their union in love with other persons; and they can be disvalued by their color, their nationality, or their religious beliefs. Things like automobiles can be valued by the degree to which we identify with them and personalize them, by their speed and comfort, and by their cost. They can be disvalued by crashing them with other cars or telephone poles. Social constructs like "the state" can be positively valued as "my country" or disvalued as "my enemy's country." But can we ascertain with exactitude the relative values of the endless combinations of value with which life confronts us? Not before the advent of formal axiology! Now it can be done with the formal calculus of value initially developed by Hartman and amplified by Forrest who shows us precisely how to do it in the following pages.

Dr. Forrest makes several helpful modifications of some of the basic notions and procedures with which Hartman began. Instead of assigning a denumerable infinity of properties to
extrinsic values, Forrest treats them as having only an indefinitely large but still finite number of properties; and he gives them the characteristic cardinal number \( k \). Hartman himself always said that extrinsic valuation is finite in actual practice. Forrest also expresses value combinations more like a mathematician than did Hartman, and he synthesized Hartman's system in a generalized equation. With this equation and the rules of inference provided by Forrest in the following pages, the resultant value of these value combinations may be determined. So can the resultant value of those value combinations involved in our ordinary and extraordinary moral dilemmas, as Forrest will demonstrate.

Dr. Forrest has now developed this approach to formal axiology to the point where both its strengths and weaknesses can be appreciated and assessed. Much work remains to be done in formal axiology, but Frank G. Forrest has advanced the discipline by a giant step.

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